Evaluation of migration to EHR with assistance of Document Imaging system

Eizen Kimura[a], Sumiko Akahori[a], Kuniko Okada[b], Teruo Aibara[b], Shinji Kobayashi[a], Ken Ishihara[a]

[a]*Dept. Medical Informatics of Medical School of Ehime University*
[b] *PSC Inc*

Abstract

Currently many healthcare institutions try aggressive EHR introduction, it is far from achieving the complete paper-less stage. Document imaging system is useful for termination of paper-based clinical document. In this study we have developed the document imaging system cooperated with EHR to compensate the weakness of EHR. Analyze of document image system's log shows that EHR still has a critical defect in the user interface so that some physicians avoid adapting to routine usage of EHR. The result suggests that the harmonization of clinical workflow with paper document is the critical component of successful EHR introduction.

Keywords:

Document imaging system, EHR, Clinical document

Introduction

Ehime University hospital has 604 beds, daily outpatient number averages out 1114 and yearly total number of inpatient is 190,000 (2008). We have introduced EHR at July 2003 and replaced EHR at May 2009. Since 2003, EHR and paper-based document had been coexisted. We had tried to avoid delivery of clinical document at the outpatient since April 2008 and completely stopped delivery at April 2009. Even we had not tried to terminate inpatient clinical document delivery, the number of paper-based inpatient clinical document greatly decreased since the EHR replacement at May 2009. However, referral form, subcontract laboratory test from out of our hospital, consent form, prescription and non-digitalized private test were remained as paper-based document.

Materials and Methods

To support a further shift to EHR and an integration of various paper-based clinical documents mainly originated in out-of-hospital, we developed the document-imaging system coordinated with EHR. We made EHR to issue scan order automatically when the document required to be scanned is printed out, giving consideration to the flow line of medic stuff and patient. We analyzed the log of document imaging system for four months of between May 2009 and Sep 2009.

Results

Regression analysis was done by simple regression on the patient number to the total document number using R. The result shows that the total scanned document was 29843 per month. A statistically significant ($P < 0.001$) strong correlation ($r = 0.874$) was observed between the number of paper documents and outpatient number. There was no statistically significant evidence of the correlation coefficient between the number of paper documents and inpatient number($r = 0.513$, $P = 0.017$). Arranged in descending order with standard residuals, following departments show major residuals; Obstetrics and Gynecology Department (2.656), Second Department of Surgery (1.683) and Pediatric (1.219) at outpatient. Ophthalmology (2.314), A Third Department of internal medicine (1.552) and A Second Department of internal medicine (1.373) at an inpatient. This shows that the status of the paperless is quite different between outpatient and inpatient even if in the same department. Low correlation between the patient number and the document number at inpatient suggests that the degree of EHR adoption varies considerably between departments. 785 document types were registered with the document imaging system. We reclassified them into 26 document types to investigate which document type is most used at outpatient department. We performed chi square analysis of the contingency table to establish significant correlation between document types and departments. We inquired into the relation between document type and department with the top 5 Person's residuals. Psychiatric ~ Progress note (re = 129.24) / Dentistry ~ the directions (re = 109.87) / Orthopedic surgery ~ Medical history form (re = 90.99) / Department of geriatrics ~ Clinical survey (re = 54.83), First department of internal medicine ~ Second opinion (re = 53.94)

Discussion

Investigation into the remnant of paper document gives these suggestions; (1) Handwriting enables taking shorthand notes, and it is much faster than EHR entry for physicians (ex. first visit progress note at psychiatry) and for patient (Interview Sheet at the orthopedic surgery department). (2) Digitalization of documents come from outside our hospital such like referral form, subcontracted laboratory test should greatly improve paperless environment. (3) EHR's disability of

showing medical records in time series and in bird-view manner required by partogram and so on greatly distracts physicians' understandings and makes physicians prefer handling with paper-based document. The quantitative analysis of the document imaging system's logs enables further investigation than an analysis based on a questionnaire in determining the priority for EHR improvement. The investigation of this study will not be directly applied with other hospitals. However the analysis method in this study should be useful in making the decision on a case-by-case basis at every hospital.

Address for correspondence

Eizen Kimura
email: ekimura@m.ehime-u.ac.jp
Dept. Medical Informatics of Medical School of Ehime University
791-0295 Situkawa Toon City Ehime Japan